

## PATENT COOPERATION TREATY

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PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

Date of mailing (day/month/year) 23 January 2001 (23.01.01)	
International application No. PCT/IB00/00778	Applicant's or agent's file reference INV1085
International filing date (day/month/year) 10 June 2000 (10.06.00)	Priority date (day/month/year) 10 June 1999 (10.06.99)
Applicant MEZZALIRA, Rinaldo	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
 20 November 2000 (20.11.00)

☐ in a notice effecting later election filed with the International Bureau on:  
 \_\_\_\_\_

2. The election ☒ was

☐ was not

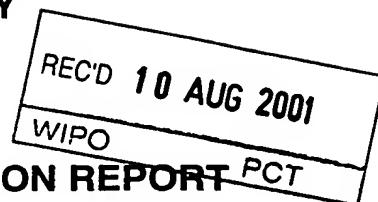
made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Pascal Piriou Telephone No.: (41-22) 338.83.38
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# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT PCT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference INV1085	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IB00/00778	International filing date (day/month/year) 10/06/2000	Priority date (day/month/year) 10/06/1999
International Patent Classification (IPC) or national classification and IPC F16L11/12		
Applicant EUROCONDOTTE S.P.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 9 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  20/11/2000	Date of completion of this report  08.08.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Vecchio, G  Telephone No. +49 89 2399 7325 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/00778

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):  
**Description, pages:**

1,5,6,9	as originally filed	
2-4,4a,7,8	with telefax of	26/06/2001

### Claims, No.:

1-14	with telefax of	26/06/2001
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### Drawings, sheets:

1/3-3/3	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/00778

- ☐ the description,      pages:  
☐ the claims,      Nos.:  
☐ the drawings,      sheets:

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

**see separate sheet**

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims	1-14
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-14
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**Re Item I**

**Basis of the report**

Some of the amendments filed with telefax of 26.06.2001 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the introduction at the end of claim 1 of the wording "the thickness increase is non-linear towards the free end of said longitudinal portions" and the corresponding modifications in claim 9 "with non-linear increase towards the free end of said longitudinal portions", as well as the parts of the amended description referring to said claims (page 3, lines 7 and 8; page 4, lines 9 and 10). It is underlined that the subject-matter of the original claim 7 concerns the non-linear increase of the increased thickness, which is different from the discussed amendment. In fact, in the context of the modified claim 1, under the wording "the thickness increase" it must be understood the transition from the smaller to the bigger constant thickness. Otherwise a contradiction would rise from the two sentences building the characterising part of claim 1, contradiction which is evident in the characterising part of the corresponding amended method claim 9 ("the increased thickness is made substantially constant and with non-linear increase").

Therefore, this report is established as if the above-mentioned amendments have not been carried out (Rule 70.2(c) PCT).

Amended independent claim 1 consists of the subject-matter of original claims 1 and 5, amended independent claim 9 is the corresponding method claim, whereas the amended dependent claims are renumbered original dependent claims.

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The subject-matter of claim 1 differs from the closest prior art, the document EP-B-0 118 613, by the features defined in the characterising part (Article 33(2) PCT).

Said distinguishing features solve the technical problem of the long extension of the increased thickness portion in order to provide the adequate resistance for the joint.

Since in the closest prior art the gradually increasing thickness of the end portions is considered as particularly advantageous for the flexibility of the hose in all its parts and as such it is present in all the described embodiments; furthermore, since no document dealing with the same technical problem suggests the particular solution as defined in claim 1, the subject-matter of the independent claim 1 is not rendered obvious by the available prior art and, thus, involve an inventive step pursuant to Article 33(3) PCT.

Independent claim 9 defines the corresponding method for the production of the aforementioned flexible hose. Hence, also the subject-matter of independent claim 9 fulfils the requirements of Article 33(3) PCT.

Dependent claims 2-8 and 10-14 are dependent on claims 1 and 9 respectively and as such meet the criteria of novelty and inventive step required by the PCT.

The industrial applicability of the invention is clearly given in the description of the application according to Article 33(4) PCT.

**Re Item VII**

**Certain defects in the international application**

Contrary to the criteria of Rule 5.1(ii) PCT, the background art disclosed in EP-B-0 118 613 is not completely correctly indicated on page 2, it being shown in said document a non-linear increase of the thickness of one of the inner and outer layers.

**Re Item VIII**

**Certain observations on the international application**

The description was not brought in conformity with the amended claims. Particularly, the embodiment described on page 6, lines 11-17, referred to on page 4, lines 20-22 and on page 8, lines 11-15 and shown in figures 5-7 does not fall within the scope of the modified claims and therefore, contrary to the requirements of Article 6 PCT, leads to unclarities when the description is used to interpret the claims.

Although on the one hand the above solutions lead to a reinforcement of the hose wall, thus making its bending more difficult, on the other hand they bring about an increase in production costs, that makes them not too favourably welcomed by the users of this specific market.

5

A further disadvantage is that in case the hose breaks and is subject to shortening at its end portions, it turns out to be mandatory to use standard joints that have the known sealing problems deriving from the difficulty there is to find special joints distributed by the normal large-scale retail trade.

10

In case reinforcements are made by hose joints, it is likewise difficult to find spare hose joints to replace those that cannot be recovered after a damaged hose has been shortened.

15

EP-A-0 118 613 discloses a flexible hose for shower and sanitary fixtures having all the features mentioned in the preamble of the attached claim 1. However, the thickness of one of the inner and outer layers is increased gradually and in a linear way and is not constant along the whole extension of longitudinal end portions. Thus, the end portion with increased thickness must have a relatively long extension in order to provide a sufficient resistance for the joints.

20

### SUMMARY OF THE INVENTION

25

A primary object of the present invention is to provide a new type of hose that is capable of being easily and effectively joined to the standard joints, in so doing maintaining its enhanced sealing properties and avoiding water leaks, while retaining its cost effectiveness at the production stage and remaining comprised in the low-cost category on the market.

30

A further specific object of the present invention is to design a hose of the type

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outlined above that features a structure that is capable of minimising the risks of breakage, twisting or detachment at the joining with the tap or with the watering tool.

- 5 The above objects are accomplished by providing a reinforced flexible hose that comprises in accordance with the attached claim 1 is characterised in that the increased thickness is substantially constant along the whole extension of the longitudinal portions and in that the thickness increase is non-linear towards the free end of said longitudinal portions.
- 10 Thanks to said reinforcements, it is thus possible to use joints of the standard type, maintaining a mechanical connection at the reinforced end of the hose, preventing the hose to detach from the joint and reducing the danger of twisting the end portion thereof during handling by the user.
- 15 A further object of the present invention is to provide a simple method for the production of a hose according to the present invention, that allows the production of great quantities thereof on a continuous basis at low costs, by using the existing equipment, though suitably modified for that purpose.
- 20 The above object is accomplished by providing a method for the production of a reinforced flexible hose that in accordance with the attached claim 9 comprises the following steps:
- a) extruding at least one first inner tubular layer (2) made of plastic material having a substantially constant advancement speed (V);
  - 25 b) weaving a textile fabrics material (4) onto the outer surface of said first layer (3), at the same advancement speed (V);
  - c) extruding at least one second tubular layer (2) made of plastic material at substantially the same advancement speed (V) of said first layer (2) and said tubular reinforcement (4) so as to allow a homogeneous fitting
  - 30 of said layers (2, 3) and form a wall having a predetermined thickness

(S);

- d) providing longitudinal portions (A, B) having an increased thickness (S', S'') in said first and/or second tubular layer (2,3) so as to enhance resistance of the hose in order to favour a stable mating to hose end joints or to other irrigation accessories;
- 5 e) cutting the hose in correspondence of said longitudinal portions (A,B) having increased thickness,

characterised in that said increased thickness is made substantially constant along the whole extension (A) of said longitudinal portions and with non-linear increase towards the free end of said longitudinal portions.

10

Step d) can be accomplished by varying the advancement speed of at least one of the said layers in correspondence at said longitudinal portions thereof having greater thickness. The speed change can be accomplished instantaneously, then the speed is kept at a constant value for a portion of its length.

15

As an alternative, step d) can also be accomplished by varying the flow of the extruded material having increased thickness.

- 20 The finished hose alternatively features end-longitudinal portions having increased thickness and being frusto-conically shaped as with their larger side in common, or it may otherwise feature a cylindrically shaped thicker portion.

- At the end of the process, the hose is cut in correspondence of the section having maximum diameter or of the middle area of the portion having increased thickness.
- 25

#### BRIEF DESCRIPTION OF THE DRAWINGS

- Further features and advantages of the present invention will be more clearly apparent in the light of the following description of a preferred but not exclusive
- 30

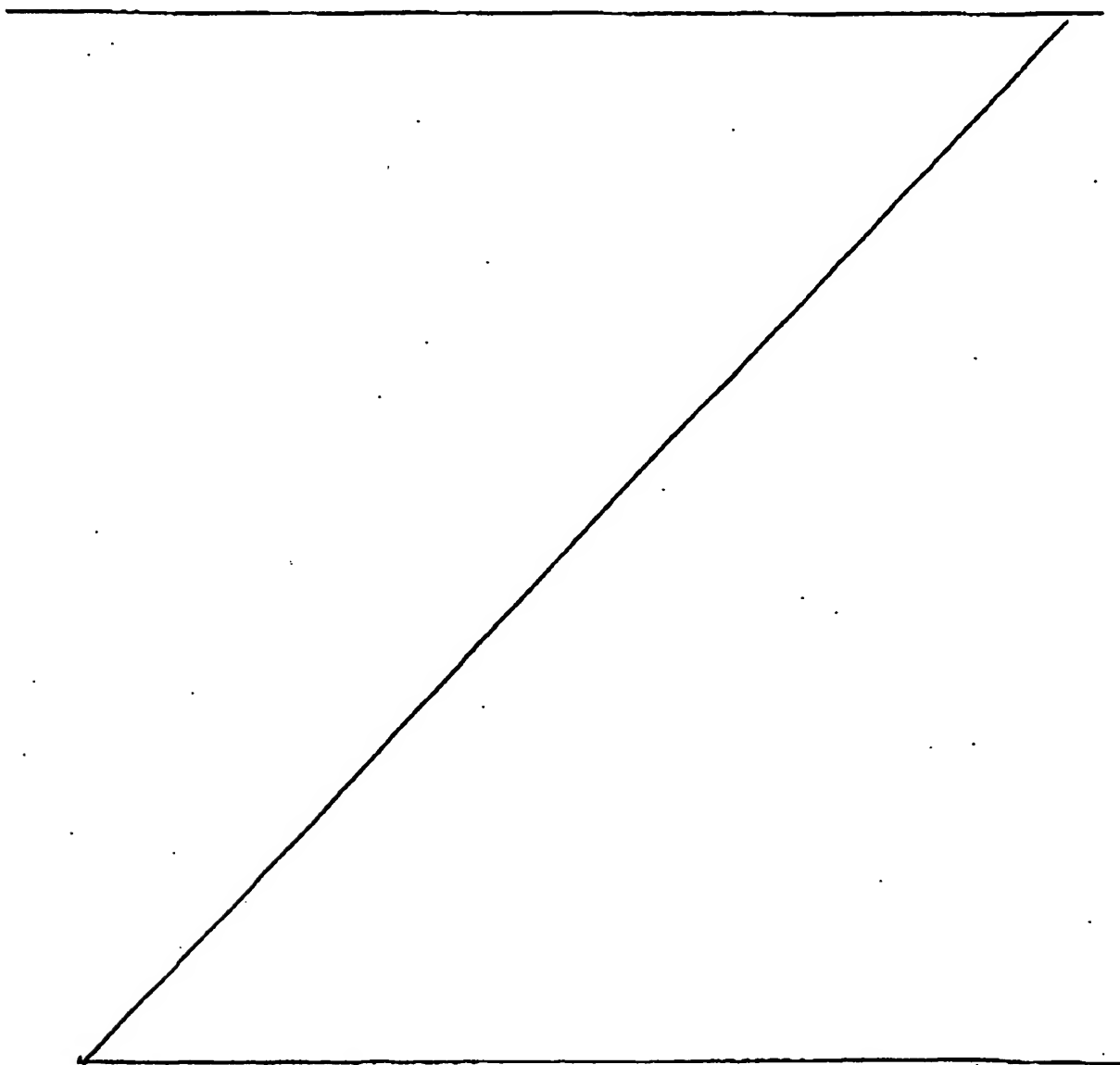
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embodiment, given by way of not limiting example, of a reinforced flexible hose illustrated in the attached drawings, wherein:

fig. 1 shows a longitudinal section view of the hose of the prior art,

fig. 2 is a cross-sectional view of the hose shown in Fig. 1;

5 fig. 3 is a general perspective view of an embodiment of the reinforced flexible hose according to the present invention;



~~5~~  
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met. The inner tubular layer can for instance be made of a material that is suitable for allowing contact with food or beverage products without releasing dangerous or harmful particles, whereas the outer layer can be made of a less noble material that is very unsuitable for alimentary use.

5

It is also possible to envisage further outer layers or films made of materials with anti-abrasive properties, or likewise being shielding against ultraviolet (UV) radiation, that have purely ornamental and aesthetic, with various different uniform or patterned colourings and pigmentations.

10

According to the present invention, reinforcement 4 can also be laid over exclusively one extruded tubular layer rather than being interposed between two co-extruded layers, if and whenever appropriate.

15 Furthermore it is possible to form the increased thickness exclusively on the inner tubular layer 2, as well as it is possible to provide the increased thickness of both layers in correspondence of the same area.

In Figs. 8 and 9 a machine for the production of a plastic hose extrusion  
20 according to the present invention is schematically depicted, that is part of a full production line for the flexible hose.

In Fig. 8 an intermediate product is shown and indicated with the reference numeral <sup>1'</sup>~~2~~ said product consisting of the inner tubular layer 2, whereon the  
25 woven or knitted tubular reinforcement fabric 4 is formed.

The semi-finished product 1' is guided by rollers 7, 8, 9 up to an extrusion head 10 that forms the outer tubular layer 3 coaxially to the product 1'. For a first embodiment, the flow Q of the material extruded from head <sup>10</sup>~~2~~ is constant and  
30 the thickness of the extruded tubular layer 3 deposited around product 1'

depends on its advancement speed  $V$  within head 10. Advancement speed  $V$  of finished tube 1 is generally constant at the very end of the production process, therefore a decrease  $\Delta V$  in the speed is accomplished combining the actuation of roller groups 7, 8 and 9 and 11, 12, 13 accompanying the hose. In particular, moving downwards the roller 8 located upstream of the extrusion head 10 and moving upwards the roller 12 located downstream of the extrusion head 10, until positioning them as shown in Fig. 8, the length of the path the tube must move along is varied, thereby reducing its velocity from  $V$  to  $V - \Delta V$  in correspondence with head 10.

10

A change in speed  $\Delta V$  can then be accomplished either gradually or instantaneously, depending on the configuration the portion with increased thickness must have. Applying a suitable algorithm to the change in advancement speed, end portions with an increased thickness can be shaped differently.

15

In a second embodiment of the production method according to the present invention, it is possible to accomplish an increase in thickness by a variation  $\Delta Q$  of extruded material flow  $Q$ , deposited by the extrusion head 10.

20

Downstream of the extrusion head 10 there may also be provided a container 14 wherein the finished hose 1 that is still warm can be subjected to further working process, or be simply allowed to cool down.

25 The production of the hose is carried out on a continuous basis and the length of the end portions where the increased thickness of the hose wall are formed is defined as a function of the overall length of the hose to be produced. When the production of a first batch is over, the segments of hose are severed at the middle point of their thickened portion. In order to identify the point where the tube is to be cut, the pigmentation and colouring of the outer layer of the

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## AMENDED CLAIMS

1. Multiple layer reinforced flexible hose comprising at least one first inner tubular layer (2) made of extruded plastic material, at least one second  
5 outer tubular layer (3) made of extruded plastic material, a tubular reinforcement (4) made of a textile material interposed between said first (2) and said second (3) layer, said layers (2, 3) being homogeneously joined in correspondence of their mutual contact surface so as to define a wall having an overall predetermined thickness (S), an end portion of said wall  
10 having an increased thickness along longitudinal portions (A, B) of predetermined extensions to thereby provide watertight sealing action with external connection organs, characterised in that said increased thickness is substantially constant along the whole extension (A) of said longitudinal portions and in that the thickness increase is non-linear towards the free  
15 end of said longitudinal portions.
2. Reinforced flexible hose according to claim 1, characterised in that said increased thickness (S') is only localised on said outer tubular layer (3).
- 20 3. Reinforced flexible hose according to claim 1, characterised in that said increased thickness (S') is only localised on said inner tubular layer (2).
4. Reinforced flexible hose according to claim 1, characterised in that said increased thickness (S') is localised on both said outer tubular layer (3) and  
25 said inner tubular layer (2).
5. Reinforced flexible hose according to claim 1, characterised in that said first (2) and said second layers (3) are coloured with different pigmentation along their whole extension or along parts thereof.

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6. Reinforced flexible hose according to claim 5, characterised in that said pigmentation and colourings are substantially uniform and they are differentiated in correspondence of the thickness change of said longitudinal portions (A, B) with predetermined extension.
7. Reinforced flexible hose according to anyone of the preceding claims, characterised in that it comprises one or more further inner, outer or middle tubular layers, made of plastic material, having technical and/or aesthetic functions.
8. Reinforced flexible hose according to claim 7, characterised in that said one or more further plastic material layers are chosen in the group comprising food compatible, anti abrasives, UV shielding and ornamental films.
9. Method for the production of a flexible hose according to anyone of claims 1 to 8, comprising the following steps:
- a) extruding at least one first inner tubular layer (2) made of plastic material having a substantially constant advancement speed (V);
  - b) weaving a textile fabrics material (4) onto the outer surface of said first layer (3), at the same advancement speed (V);
  - c) extruding at least one second tubular layer (2) made of plastic material at substantially the same advancement speed (V) of said first layer (2) and said tubular reinforcement (4) so as to allow a homogeneous fitting of said layers (2, 3) and form a wall having a predetermined thickness (S);
  - d) providing longitudinal portions (A, B) having an increased thickness (S', S'') in said first and/or second tubular layer (2,3) so as to enhance resistance of the hose in order to favour a stable mating to hose end joints or to other irrigation accessories;

e) cutting the hose in correspondence of said longitudinal portions (A,B) having increased thickness,

characterised in that said increased thickness is made substantially constant along the whole extension (A) of said longitudinal portions and with non-linear increase towards the free end of said longitudinal portions.

- 5
10. Method according to claim 9, characterised in that said step d) is accomplished by means of a change ( $\Delta V$ ) in the advancement speed (V) for at least one of said layers (2, 3) in correspondence of said layers (A, B) having increased thickness, said speed change ( $\Delta V$ ) being carried out instantaneously and being subsequently reduced to zero along said longitudinal portions (A).
- 10
11. Method according to claim 9, characterised in that said step d) is accomplished by means of a change ( $\Delta Q$ ) in the flow (Q) of extruded material in correspondence of the increase in thickness, said flow change ( $\Delta Q$ ) being instantaneous.
- 15
12. Method according to anyone of claims 9 to 11, characterised in that said phase d) is accomplished by thickening only said first inner layer (3).
- 20
13. Method according to anyone of claims 9 to 12, characterised in that said phase d) is accomplished by thickening only said second outer layer (2).
- 25
14. Method according to anyone of claims 9 to 12, characterised in that said phase d) is accomplished by thickening both said inner (3) and said outer (2) layers.

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>INV1085</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/IB 00/ 00778</b>	International filing date (day/month/year) <b>10/06/2000</b>	(Earliest) Priority Date (day/month/year) <b>10/06/1999</b>
Applicant <b>EUROCONDOTTE S.P.A. et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of Invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

**5**☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/ 00/00778

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 F16L11/12 F16L35/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29C F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 118 613 B (VOHRER CHRISTOPH) 5 November 1986 (1986-11-05)	1-4, 6, 7, 12, 13, 16-19 5, 8-11
Y		14
A	column 3, line 11 -column 8, line 17; figures	
Y	DE 11 65 947 B (WETZELL GUMMIWERKE AG) 19 March 1964 (1964-03-19)	5
A	column 1, line 1 -column 3, line 36; figures	1-3, 15
Y	US 5 332 160 A (RUSKIN RODNEY R) 26 July 1994 (1994-07-26)	8-11
A	column 2, line 7 - line 35 column 3, line 63 -column 4, line 12; figure 4	1, 12
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

5 September 2000

Date of mailing of the international search report

12/09/2000

Name and mailing address of the ISA

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Authorized officer

Axelsson, T

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/92/00778

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 84 04574 A (ENITOR B V) 22 November 1984 (1984-11-22) page 4, line 23 -page 5, line 4 ----	1
A	EP 0 685 676 A (GROHE KG HANS) 6 December 1995 (1995-12-06) abstract ----	1,8-11
A	EP 0 289 369 B (CAOUTCHOUC MANUF PLASTIQUE) 22 January 1992 (1992-01-22) column 2, line 10 - line 19 column 3, line 26 - line 30 column 4, line 27 - line 33; figure 1B -----	1,10-12

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/92/00778

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0118613	B	19-09-1984	DE 3304079 C AT 23398 T DE 3367448 D EP 0118613 A JP 59170504 A	12-07-1984 15-11-1986 11-12-1986 19-09-1984 26-09-1984
DE 1165947	B		NONE	
US 5332160	A	26-07-1994	WO 9513882 A AU 673728 B AU 6225994 A	26-05-1995 21-11-1996 06-06-1995
WO 8404574	A	22-11-1984	EP 0143808 A	12-06-1985
EP 0685676	A	06-12-1995	DE 4419120 A AT 189835 T AT 189735 T DE 59507764 D DE 59507806 D EP 0685675 A ES 2144536 T ES 2144543 T JP 8047982 A US 5555913 A	07-12-1995 15-03-2000 15-02-2000 16-03-2000 23-03-2000 06-12-1995 16-06-2000 16-06-2000 20-02-1996 17-09-1996
EP 0289369	B	02-11-1988	FR 2614671 A AT 71877 T CA 1339258 A DE 3867895 A EP 0289369 A ES 2029039 T GR 3003791 T JP 63299918 A JP 63288739 A JP 63297888 A KR 9303786 B MX 169724 B US 5259112 A	04-11-1988 15-02-1992 12-08-1997 05-03-1992 02-11-1988 16-07-1992 16-03-1993 07-12-1988 25-11-1988 05-12-1988 10-05-1993 21-07-1993 09-11-1993

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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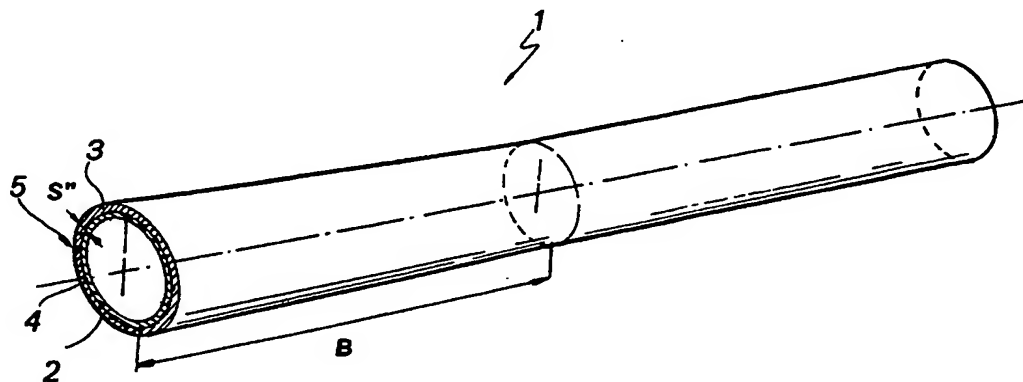
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(54) Title: REINFORCED FLEXIBLE HOSE AND METHOD FOR THE PRODUCTION THEREOF



(57) Abstract: A reinforced flexible hose (1) comprising at least a first inner extruded tubular layer (3) and at least a second extruded tubular layer (2) with a tubular reinforcement fabric (4) provided between said first (3) and second (2) hoses. The two tubes are joined so as to form a homogeneous unit by their mutual contact surfaces, by gluing or molecular adhesion for example. The end portion of the hose (1) increases in width so much as to make it possible to achieve a better mechanical hold with the standard junctions to which it is bound to be fixed. The thickness increases at the end portions may either be constant along its whole length, or start gradually toward the end.

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**"REINFORCED FLEXIBLE HOSE AND METHOD FOR THE PRODUCTION THEREOF"**

**FIELD OF THE INVENTION**

5

The present invention relates to a reinforced flexible hose, particularly but not exclusively suitable for the field of gardening.

**BACKGROUND OF THE INVENTION**

10

Flexible hoses are known which belong to the cheap category of the market. In order to control production costs, these are produced joining two coaxial tubular layers having reduced thickness, by means of the insertion of a knitted or woven reinforcement therebetween.

15

The above mentioned types of hoses are usually employed in connection with mounts, joints or irrigation tools having standard size and manufactured on a mass scale. Tubes having a reduced thickness are hard to join to the standard quick-fit joints, therefore a short while after the hose starts being used, water  
20 leaks are often found to occur through the joining area.

25

A further disadvantage of said known hoses is that they are prone to be easily twisted and damaged where they connect with the joint, most often in proximity of the water mains tap.

Several attempts to overcome the above shortcomings were made in the past, for instance fixing joints that are pressed and made to be suitable for the hose either at the production stage or resorting to hose joints to be fixed between the hose and the standard joint, said hose joints being made of a similar material to  
30 that the tube is made of and further being suitably secured.

Although on the one hand the above solutions lead to a reinforcement of the hose wall, thus making its bending more difficult, on the other hand they bring about an increase in production costs, that makes them not too favourably welcomed by the users of this specific market.

5

A further disadvantage is that in case the hose breaks and is subject to shortening at its end portions, it turns out to be mandatory to use standard joints that have the known sealing problems deriving from the difficulty there is to find special joints distributed by the normal large-scale retail trade.

10

In case reinforcements are made by hose joints, it is likewise difficult to find spare hose joints to replace those that cannot be recovered after a damaged hose has been shortened.

15

### SUMMARY OF THE INVENTION

A primary object of the present invention is to provide a new type of hose that is capable of being easily and effectively joined to the standard joints, in so doing maintaining its enhanced sealing properties and avoiding water leaks, while retaining its cost effectiveness at the production stage and remaining comprised in the low-cost category on the market.

A further specific object of the present invention is to design a hose of the type outlined above that features a structure that is capable of minimising the risks of breakage, twisting or detachment at the joining with the tap or with the watering tool.

The above objects are accomplished by providing a reinforced flexible hose that comprises at least one first extruded tubular layer provided internally of at least one second tubular extruded layer, a tubular reinforcement of a textile fabrics

material provided between said first and said second layers, said layers being joined in correspondence of their mutual contact surfaces, wherein an end portion of the hose has an increased thickness along a predetermined length.

- 5 Thanks to said reinforcements, it is thus possible to use joints of the standard type, maintaining a mechanical connection at the reinforced end of the hose, preventing the hose to detach from the joint and reducing the danger of twisting the end portion thereof during handling by the user.
- 10 A further object of the present invention is to provide a simple method for the production of a hose according to the present invention, that allows the production of great quantities thereof on a continuous basis at low costs, by using the existing equipment, though suitably modified for that purpose.
- 15 The above object is accomplished by providing a method for the production of a reinforced flexible hose according to the present invention, characterised in that it comprises the following steps:
- a) extrusion of at least one first tubular layer of plastic material having a predetermined thickness and a predetermined advancement speed;
  - 20 b) weaving a tubular reinforcement on the outer surface of said first layer, with said predetermined advancement speed,
  - c) extrusion of at least one second tubular layer made of plastic material all around said first layer as well as of said tubular reinforcement, so as to allow a homogeneous joining therebetween, at substantially the same advancement speed;
  - 25 d) formation on said first and/or on said second tubular layers of longitudinal portions having increased thickness so as to enhance the intrinsic resistance of the hose in order to enhance stable attachment thereof to end joints and/or other irrigation
  - 30

accessories;

e) cutting the hose in the over of increased thickness.

Step d) can be accomplished by varying the advancement speed of at least one  
5 of the said layers in correspondence at said longitudinal portions thereof having  
greater thickness. The speed change can be accomplished either in a gradual  
fashion so as to increase the hose thickness along a portions of its length, or  
instantaneously, then the speed is kept at a constant value for a portion of its  
length.

10 As an alternative, step d) can also be accomplished by varying the flow of the  
extruded material having increased thickness.

The finished hose alternatively features end-longitudinal portions having  
15 increased thickness and being frusto-conically shaped as with their larger side in  
common, or it may otherwise feature a cylindrically shaped thicker portion.

At the end of the process, the hose is cut in correspondence of the section  
having maximum diameter or of the middle area of the portion having increased  
20 thickness.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Further features and advantages of the present invention will be more clearly  
25 apparent in the light of the following description of a preferred but not exclusive  
embodiment, given by way of not limiting example, of a reinforced flexible hose  
illustrated in the attached drawings, wherein:

fig. 1 shows a longitudinal section view of the hose of the prior art,

fig. 2 is a cross-sectional view of the hose shown in Fig. 1.

30 fig. 3 is a general perspective view of an embodiment of the reinforced

flexible hose according to the present invention;

fig. 4 is a longitudinal sectional view of a first embodiment of the present invention;

fig. 5 is a general perspective view of a second embodiment of the reinforced flexible hose according to the present invention;

fig. 6 is a cross sectional view of the embodiment of flexible hose shown in Fig. 5;

fig. 7 is a cross sectional view of the hose shown in Fig. 6;

fig. 8 is a schematic side view of a device for the production of a hose according to the present invention, with said device in a first operating position;

fig. 9 is a schematic side view of the device shown in Fig. 8, with said device in a second operating phase.

#### DESCRIPTION OF SOME PREFERRED FORMS OF EMBODIMENT

15

With reference to Figs. 1 and 2 a flexible hose of the prior art is shown, generally indicated with the reference numeral 1, that is essentially formed by two tubular coaxial layers, respectively an inner layer having an inner diameter  $D_i$  and an outer layer having an outer diameter  $D_e$ , and with a tubular reinforcement or stock 4 made of fibrous material, of the woven or knitted type, that is interposed between the two layers 2, 3 and extends over the entire length thereof.

Layers 2, 3 are made of extruded plastic materials and are mutually joined in correspondence of their mutual contact surface with the interposition of reinforcement 4 so as to form a wall having an overall thickness  $S$  that is substantially constant, except the working tolerances connected with the extrusion of layers with the weaving of the reinforcement fabrics 4.

30 Figs. 3 and 4 show a first embodiment of hose 1 according to the present

invention, said hose having a thickness  $S'$  along a portion A of its length starting at one end 5, said thickness being increased with respect to thickness  $S$  of the portion of hose 1 that is the furthest from its end 5.

- 5 In this first embodiment, tube wall 1 has either a substantially constant thickness along the whole portion A past circular step 6 or an extremely short conical connecting portion. Thus it will be possible to promote a stable watertight mating with connecting organs or gardening hose joints, thereby avoiding water leakages and any sort of breakages at those hose joints.

10

According to a second embodiment of the reinforced flexible hose of the present invention, illustrated by Figs. 4, 5 and 6, the increase in thickness of the hose wall is accomplished by a gradual increase in thickness of the outer layer 3 starting from point 6 where the wall has a thickness that is equal to the average  
15 normal thickness  $S$ . Therefore thickness increases in a linear fashion until it reaches a maximum value  $S''$  in correspondence of end 5. This is accomplished by means of an increase in thickness limited to the outer layer 3.

In general, longitudinal portions A and B having increased thickness allow the  
20 accomplishment of a stable mechanical grip with standard joints or irrigation tools and accessories of the threaded ferrule type, that has an enhanced mechanical and hydraulic resistance where the hose has a greater thickness.

In view of the fact that the greatest stresses caused by the user's handling are  
25 localised where the joints are coupled to the hose, the reinforcement according to the present invention brings about a reduction in the ease with which the hose bends and twists, with a further advantage for the user.

Layers 2, 3 that form the hose can be made of the same or of different  
30 materials, in accordance with the technical and aesthetic requirements to be

met. The inner tubular layer can for instance be made of a material that is suitable for allowing contact with food or beverage products without releasing dangerous or harmful particles, whereas the outer layer can be made of a less noble material that is very unsuitable for alimentary use.

5

It is also possible to envisage further outer layers or films made of materials with anti-abrasive properties, or likewise being shielding against ultraviolet (UV) radiation, that have purely ornamental and aesthetic, with various different uniform or patterned colourings and pigmentations.

10

According to the present invention, reinforcement 4 can also be laid over exclusively one extruded tubular layer rather than being interposed between two co-extruded layers, if and whenever appropriate.

15 Furthermore it is possible to form the increased thickness exclusively on the inner tubular layer 2, as well as it is possible to provide the increased thickness of both layers in correspondence of the same area.

In Figs. 8 and 9 a machine for the production of a plastic hose extrusion  
20 according to the present invention is schematically depicted, that is part of a full production line for the flexible hose.

In Fig. 8 an intermediate product is shown and indicated with the reference numeral 1, said product consisting of the inner tubular layer 2, whereon the  
25 woven or knitted tubular reinforcement fabric 4 is formed.

The semi-finished product 1' is guided by rollers 7, 8, 9 up to an extrusion head 10 that forms the outer tubular layer 3 coaxially to the product 1'. For a first embodiment, the flow Q of the material extruded from head 9 is constant and  
30 the thickness of the extruded tubular layer 3 deposited around product 1'

depends on its advancement speed  $V$  within head 10. Advancement speed  $V$  of finished tube 1 is generally constant at the very end of the production process, therefore a decrease  $\Delta V$  in the speed is accomplished combining the actuation of roller groups 7, 8 and 9 and 11, 12, 13 accompanying the hose. In particular, moving downwards the roller 8 located upstream of the extrusion head 10 and moving upwards the roller 12 located downstream of the extrusion head 10, until positioning them as shown in Fig. 8, the length of the path the tube must move along is varied, thereby reducing its velocity from  $V$  to  $V - \Delta V$  in correspondence with head 10.

10

A change in speed  $\Delta V$  can then be accomplished either gradually or instantaneously, depending on the configuration the portion with increased thickness must have. Applying a suitable algorithm to the change in advancement speed, end portions with an increased thickness can be shaped differently.

15

In a second embodiment of the production method according to the present invention, it is possible to accomplish an increase in thickness by a variation  $\Delta Q$  of extruded material flow  $Q$ , deposited by the extrusion head 10.

20

Downstream of the extrusion head 10 there may also be provided a container 14 wherein the finished hose 1 that is still warm can be subjected to further working process, or be simply allowed to cool down.

25 The production of the hose is carried out on a continuous basis and the length of the end portions where the increased thickness of the hose wall are formed is defined as a function of the overall length of the hose to be produced. When the production of a first batch is over, the segments of hose are severed at the middle point of their thickened portion. In order to identify the point where the tube is to be cut, the pigmentation and colouring of the outer layer of the

30

finished hose may be varied. Such pigmentation and colour may be varied along the end portions in order to produce hoses having longitudinal portions with a different colour, so as to easily highlight the area where variations in thickness occur. To this end, it is likewise possible to carry out the injection of pigmented material having different colours through head 10.

The overall colouring of the hose, that is of its outer layer, and possibly as well as of the woven reinforcement fabrics can be accomplished with materials that are either uniformly coloured or that are striped, using the same or different colours. Colour combinations are also possible in so doing obtaining a wide range of aesthetic, optical and visual effects.

## CLAIMS

1. Multiple layer reinforced flexible hose comprising at least one first inner tubular layer (2) made of extruded plastic material, at least one second  
5 outer tubular layer (3) made of extruded plastic material, a tubular reinforcement (4) made of a textile material interposed between said first (2) and said second (3) layer, said layers (2, 3) being homogeneously joined in correspondence of their mutual contact surface so as to define a wall having an overall predetermined thickness  
10 (S), wherein an end portion of said wall has an increased thickness along longitudinal portions (A, B) having predetermined extensions to thereby provide watertight sealing action with external connection organs.
- 15 2. Reinforced flexible hose according to claim 1, characterised in that said increased thickness (S') is only localised on said outer tubular layer (3).
3. Reinforced flexible hose according to claim 1, characterised in that said increased thickness (S') is only localised on said inner tubular layer (2).  
20
4. Reinforced flexible hose according to claim 1, characterised in that said increased thickness (S') is localised on both said outer tubular layer (3) and said inner tubular layer (2).
- 25 5. Reinforced flexible hose according to claim 1, characterised in that said increased thickness is substantially constant along the whole extension (A) of said longitudinal portions.
6. Reinforced flexible hose according to claim 1, characterised in that said  
30 increased thickness increases gradually towards the free end of said

longitudinal portions (B).

- 5      7.      Reinforced flexible hose according to claim 1, characterised in that said increased thickness increases non-linearly towards the free end of said longitudinal portions.
- 10      8.      Reinforced flexible hose according to anyone of the preceding claims characterised in that said first (2) and said second layers (3) are coloured with different pigmentations along their whole extension or along parts thereof.
- 15      9.      Reinforced flexible hose according to claim 8, characterised in that said pigmentations and colourings are substantially uniform and they are differentiated in correspondence of the thickness change of said longitudinal portions (A, B) with predetermined extension.
- 20      10.      Reinforced flexible hose according to anyone of the preceding claims, characterised in that it comprises one or more further inner, outer or middle tubular layers, made of plastic material, having technical and/or aesthetic functions.
- 25      11.      Reinforced flexible hose according to claim 10, characterised in that said one or more further plastic material layers are chosen in the group comprising food compatible, anti abrasives, UV shielding and ornamental films.
- 30      12.      Method for the production of the flexible hose according to anyone of claims 1 to 11, characterised in that it comprises the following steps:  
            a) extrusion of at least a first inner tubular layer (2) made of plastic

material having a substantially constant advancement speed (V);

b) weaving textile fabrics material (4) onto the outer surface of said first layer (3), at the same advancement speed;

c) extrusion of at least a second tubular layer (2) made of plastic material at substantially the same advancement speed, on said first layer (2) and said tubular reinforcement (4) so as to allow a homogeneous fitting of said layers (2, 3) so as to form a wall having a predetermined thickness (S);

d) production of longitudinal portions (A, B) having an increased thickness (S', S'') in said first and/or second tubular layer (2,3) so as to enhance resistance of the hose in order to favour a stable mating to hose end joints or to other irrigation accessories;

e) cutting the hose in correspondence of said longitudinal portions (A,B) having increased thickness.

13. Method according to claim 12, characterised in that said step d) is accomplished by means of a change ( $\Delta V$ ) in the advancement speed (V) for at least one of said layers (2, 3) in correspondence with said layers (A, B) having increased thickness.

14. Method according to claim 13, characterised in that the change ( $\Delta V$ ) in advancement speed is accomplished in a gradual fashion so that the thickness of said wall linearly increases along said longitudinal portions (B) having a length reaching a maximum predetermined value (S'').

15. Method according to claim 13, characterised in that the change ( $\Delta V$ ) in advancement speed is carried out instantaneously and it is subsequently reduced to zero along longitudinal portions (A) having a predetermined

length such that they increase the thickness (S) in said longitudinal portions of the hose (1) up to a maximum predetermined value (S').

16. Method according to claim 12, characterised in that said phase d) is  
5 accomplished by a change ( $\Delta Q$ ) in the flow (Q) of extruded material in  
correspondence of the increase in thickness.
17. Method according to anyone of claims 12 to 16, characterised in that  
10 said phase d) is accomplished by thickening only said first inner layer  
(3).
18. Method according to anyone of claims 12 to 16, characterised in that  
said phase d) is accomplished by thickening only said second outer layer  
15 (2).
19. Method according to anyone of claims 12 to 16, characterised in that  
said phase d) is accomplished by thickening both said inner (3) and said  
outer (2) layers.

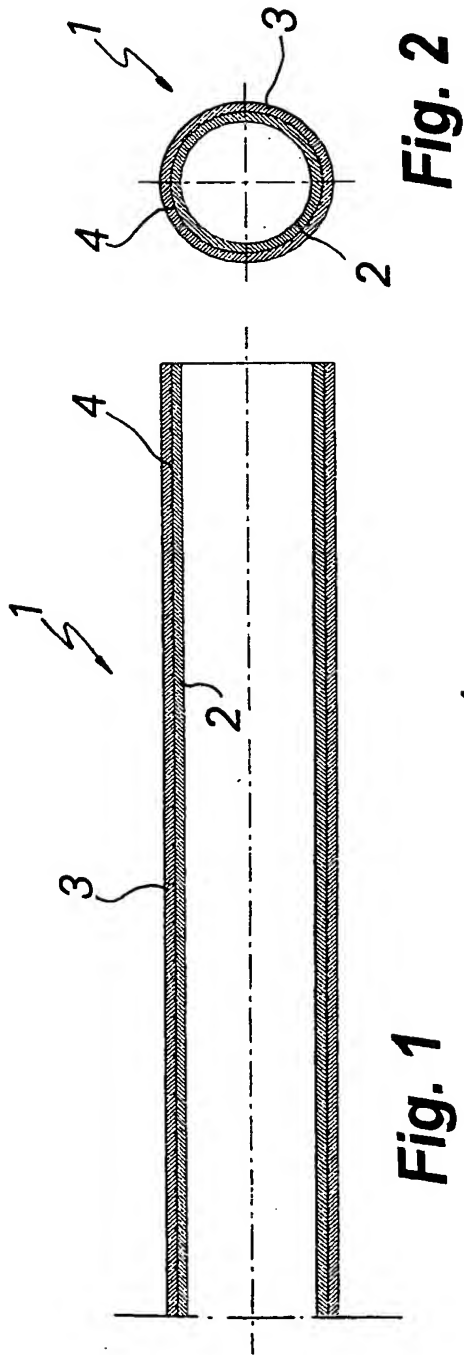


Fig. 1

Fig. 2

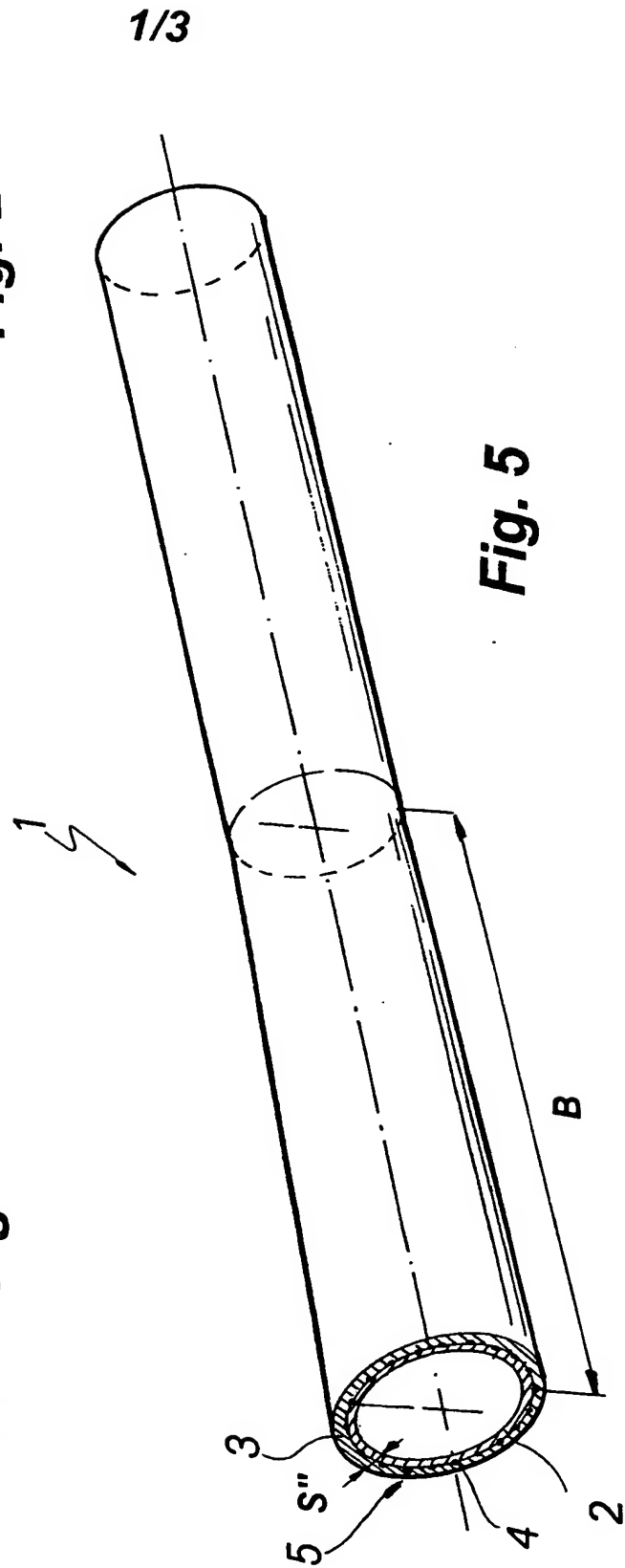


Fig. 5

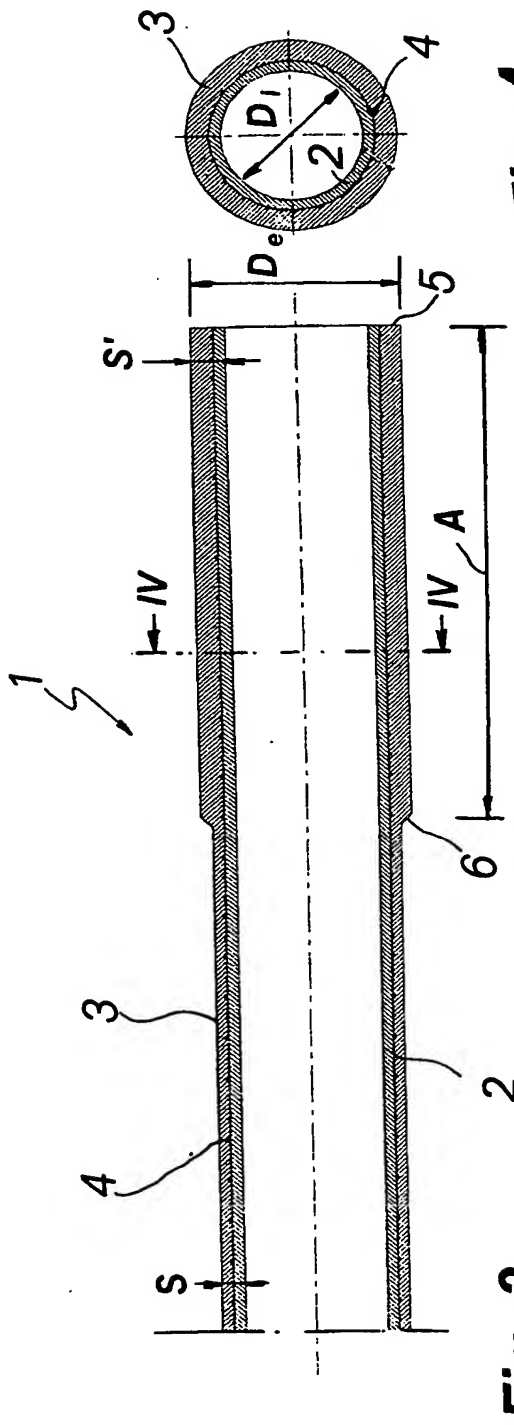


Fig. 4

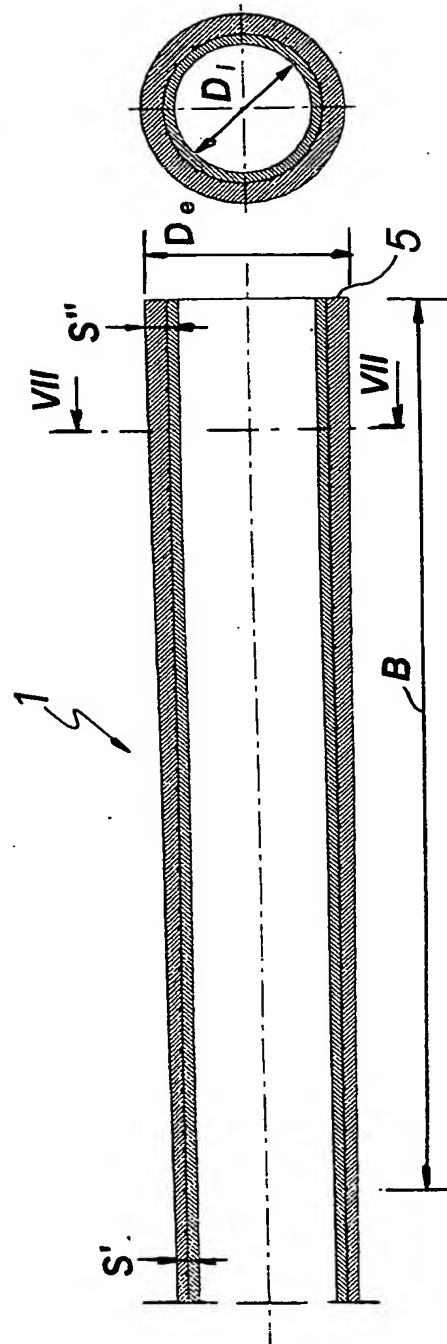


Fig. 6

Fig. 7

3/3

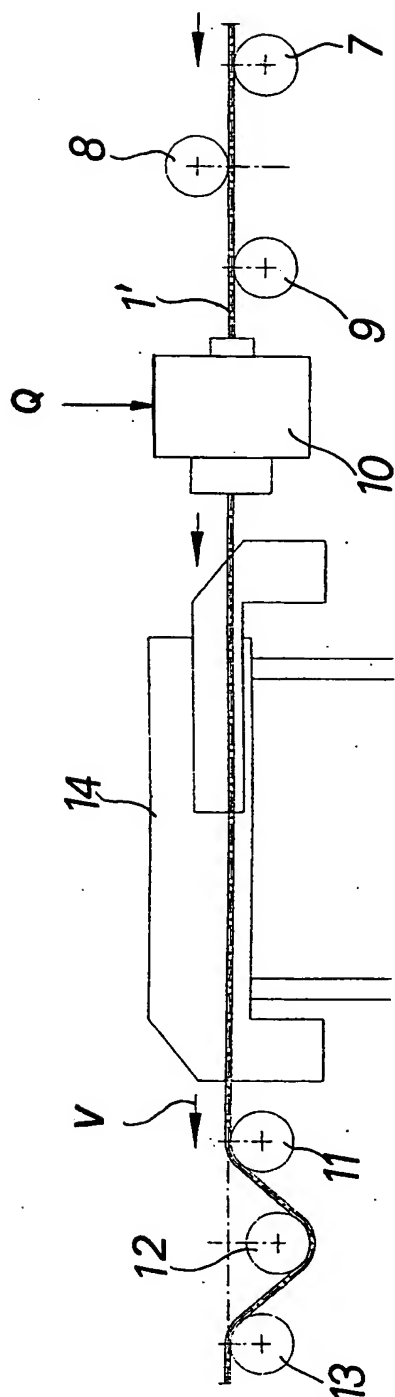


Fig. 8

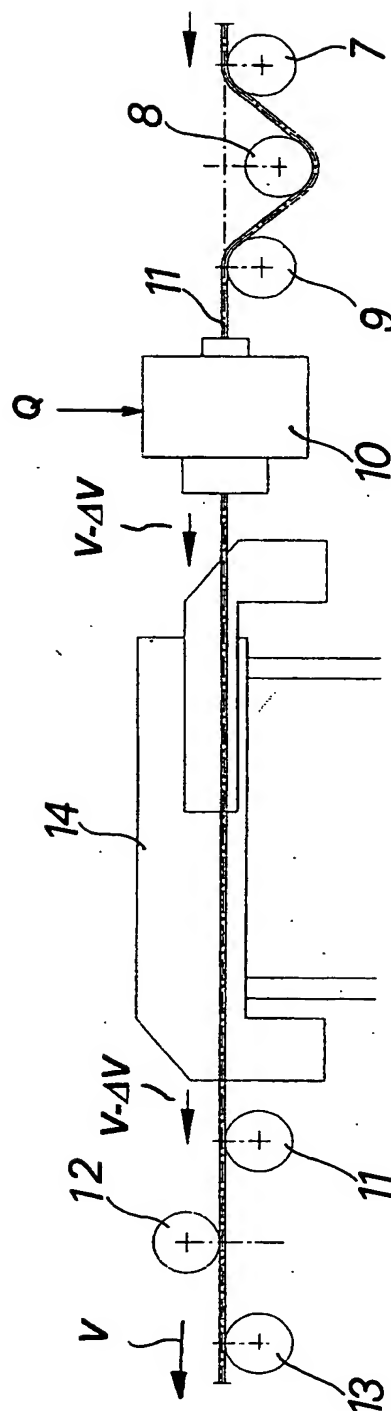


Fig. 9

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 00/00778

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 F16L11/12 F16L35/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B29C F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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A	column 2, line 7 - line 35 column 3, line 63 -column 4, line 12; figure 4	1,12
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

5 September 2000

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# INTERNATIONAL SEARCH REPORT

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PCT/IB 00/00778

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